First Great Western

READING TURBO MAINTENANCE DEPOT

CLASS 165/166 TURBO

W.S.P.

WHEELSLIP/SLIDE PROTECTION UNIT

1. INTRODUCTION

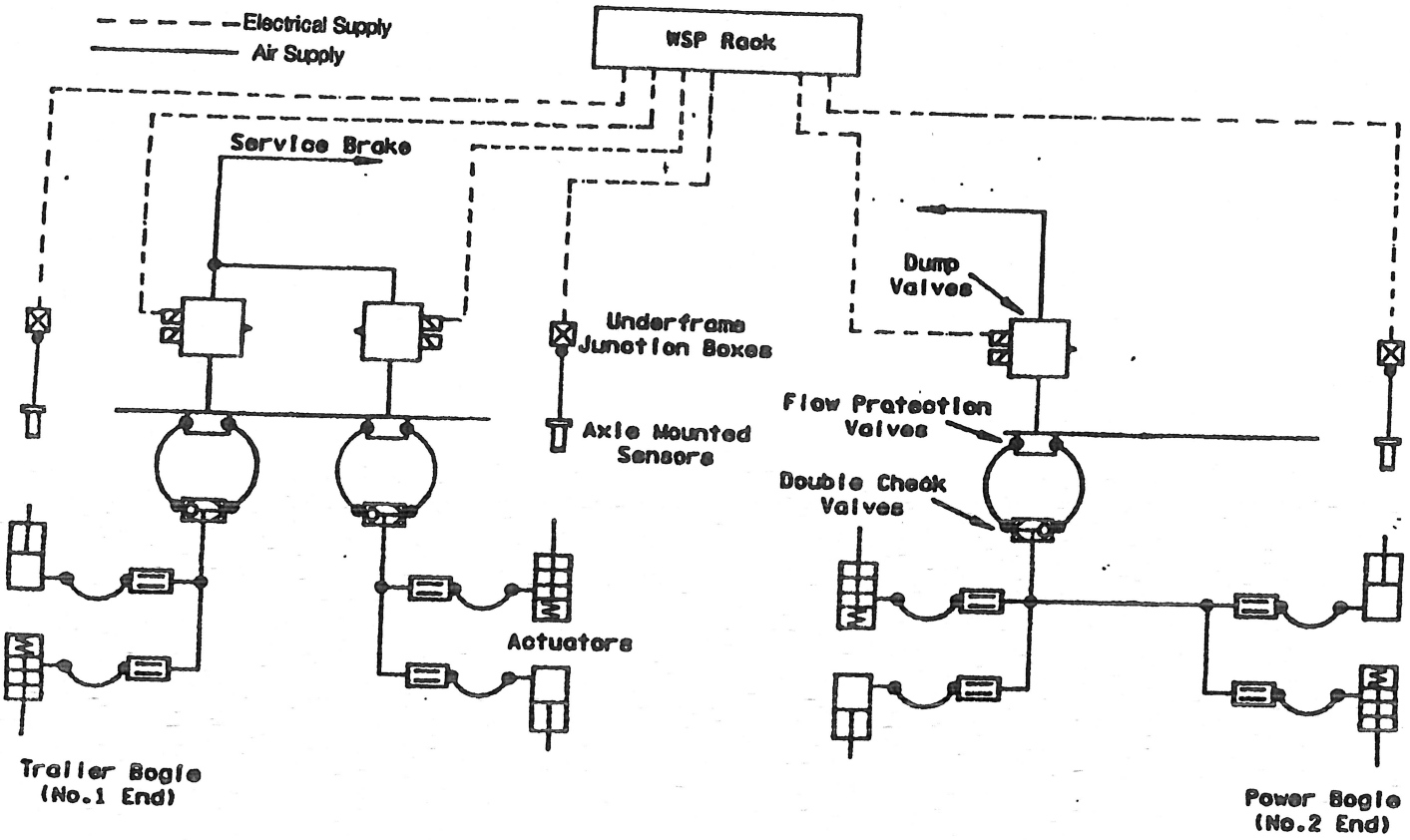
Increased requirements of modern rolling stock such as rising speeds, higher safety standards, ease of maintenance etc. are the reasons for incorporating a new generation of anti-slide protection on the Class 165 turbo vehicle.

THE W.G. MICROCOMPUTER ANTI-SLIDE SYSTEM

This system comprises the following:-

3 - Axle end probe assemblies (sensors)
3 - Dump valves (Blowdown valves)
1 - W.S.P. control rack

2. WHEELSLIDE PROTECTION SYSTEM



3. EQUIPMENT OPERATION

3.1 WHEELSLIDE CONDITION

Under adverse adhesion conditions such as wet or greasy rails the microcomputer operates by comparing the rpm at axle ends. Then venting and charging the brake cylinder, air pressure via the dump valves until normal braking is achieved. This prevents the wheels from sliding in any braking condition.

If all axles on a vehicle are decelerating equally or slide at the same time, the computer compares actual axle deceleration with the permissible deceleration of the vehicle, and then the brake pressure is released and adjusted until normal braking is achieved.

3.2 WHEELSLIP/SPIN CONDITION

The microcomputer is also capable of detecting wheelslip, often called wheelspin. When this occurs, the engine power is decreased until the wheelspin is corrected. Engine power is then gradually increased in stages up to the rate set by the drivers power controller.

A "TRACTION" or "POWER-ON" signal is fed to the WSP Rack whenever traction power is being provided. This allows the system to identify the difference between a wheelslide and wheelslip.

4. W.S.P. EQUIPMENT

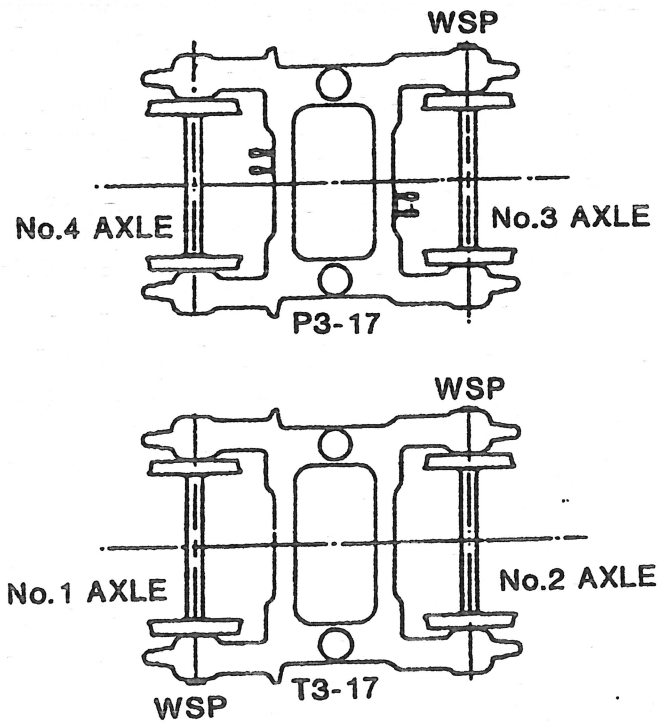
4.1 AXLE END PROBE ASSEMBLY

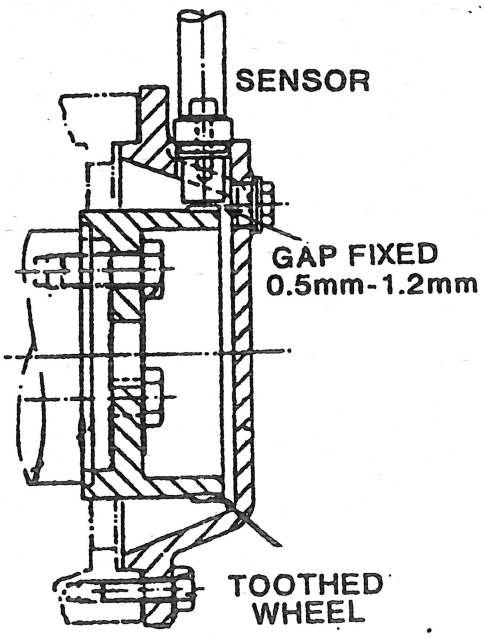
Each assembly is a toothed gearwheel mounted on the axle end. Rotation of the gearwheel is detected by a magnetic probe within the bearing cover. The probe then transmits this signal to the Control Rack.

Only 3 probe assemblies are required as power bogies have mechanically coupled wheelsets.

The probe gap is non-adjustable and is fixed between 0.5mm - 1.2mm.

WSP LOCATION DIAGRAMS





4.2 DUMP VALVE.

The dump valve, one per axle probe, is bracket mounted on the underframe and contains charging and venting solenoid valves controlled independently by the W.S.P. rack.

DURING BRAKING.

a) Can reduce brake cylinder pressure, if required, to prevent the wheelset from 'locking up'.

b) Maintain a reduced brake cylinder pressure to maximise use of the available adhesion.

c) Allows build-up of full brake cylinder pressure.

4.3 W.S.P. CONTROL RACK.

The W.S.P. control rack is contained within a weatherproof metal box mounted on the underframe R.H. side of each vehicle. Inside between seat backs on a 166. The rack is made up of several electronic computer boards.

Under normal operating conditions the computer monitors and compares the output from the probes and the W.S.P. unit is 'idling'. This is because all wheels will be rotating at the same speed.

The microcomputer is automatic and self testing and faults on the W.S.P. system are stored and then indicated by a digital display when the memory recall button is operated.

It also provides the following outputs:-

a) Speedometer current(0-20Ma = 0-90mph)

b) Low speed signal for control of doors, D.S.D., fire protection etc.

c) Drive for OTMR system.

d) Signal to OTMR to indicate WSP activity.

e) Self diagnostic fault indication.

f) Indication to driver of wheelslip or wheelspin activity.

g) Indication to driver of fault in W.S.P.

h) Wheelspin signal to traction control.

4.3.1 W.S.P. Automatic Test.

Carry Out Safety Precautions.

1. Ensure start battery is switched 'ON'.

2. Release cover of electronics case.

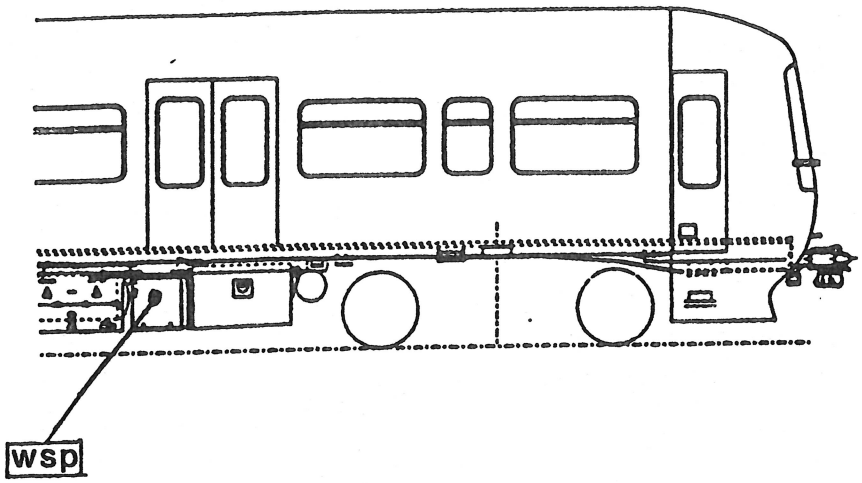
3. Depress TEST button for at least 3 seconds.

The test programme will run automatically for approximately 1 minute and will display '89' on the LED panel. During the test the dump valves are tested one after the other so that 2 axles are always braked. If system O.K. LED displays '99'.

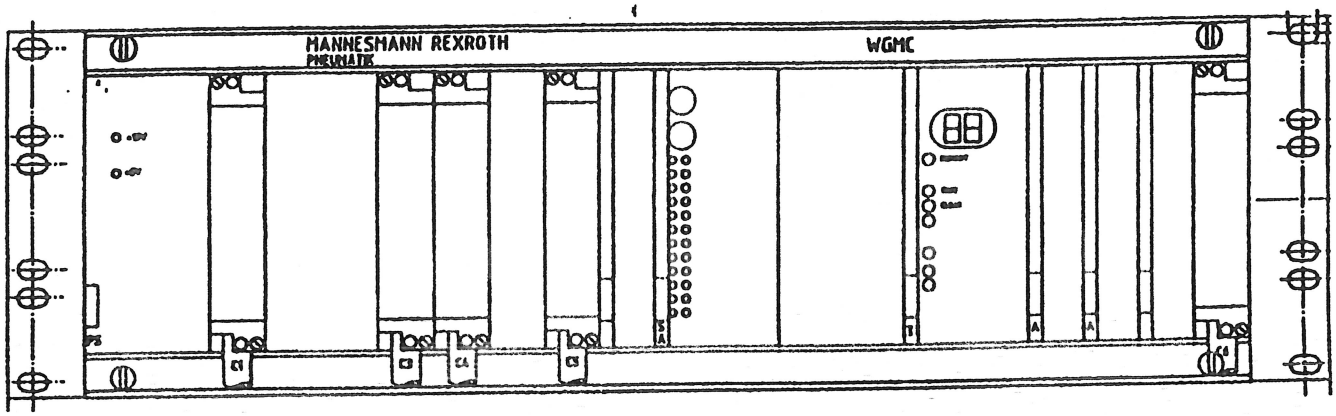
4. Investigate and rectify faults.

5. Replace cover of electronics case.

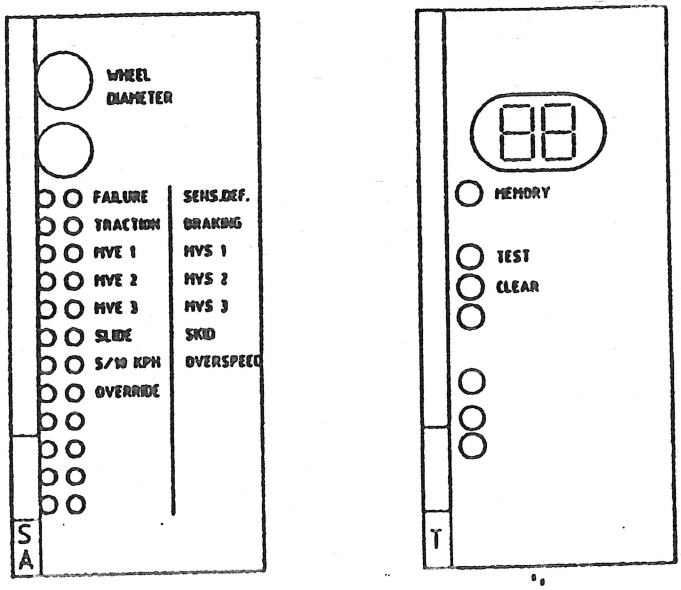
WSP RACK LOCATION



WSP RACK



WSP DIAGNOSTIC CIRCUIT BOARDS



4.3.2 Memory Recall

Carry out Safety Precautions

1. Ensure Start Battery is switched 'ON'

2. Release cover of electronics case

3. Depress the MEMORY button on the test card for at least 3 seconds and the following takes place:-

   a) LED test 88 displays for 3 seconds

   b) Code for adjusted wheel diameter

   c) Display of all stored faults in a 3 second display for each fault

   d) Stops on first display on completion

   Diagnosis chart on following page.

4. Rectify faults as necessary

   Memory can be erasing by depressing the CLEAR button on the test card for at least 3 seconds.

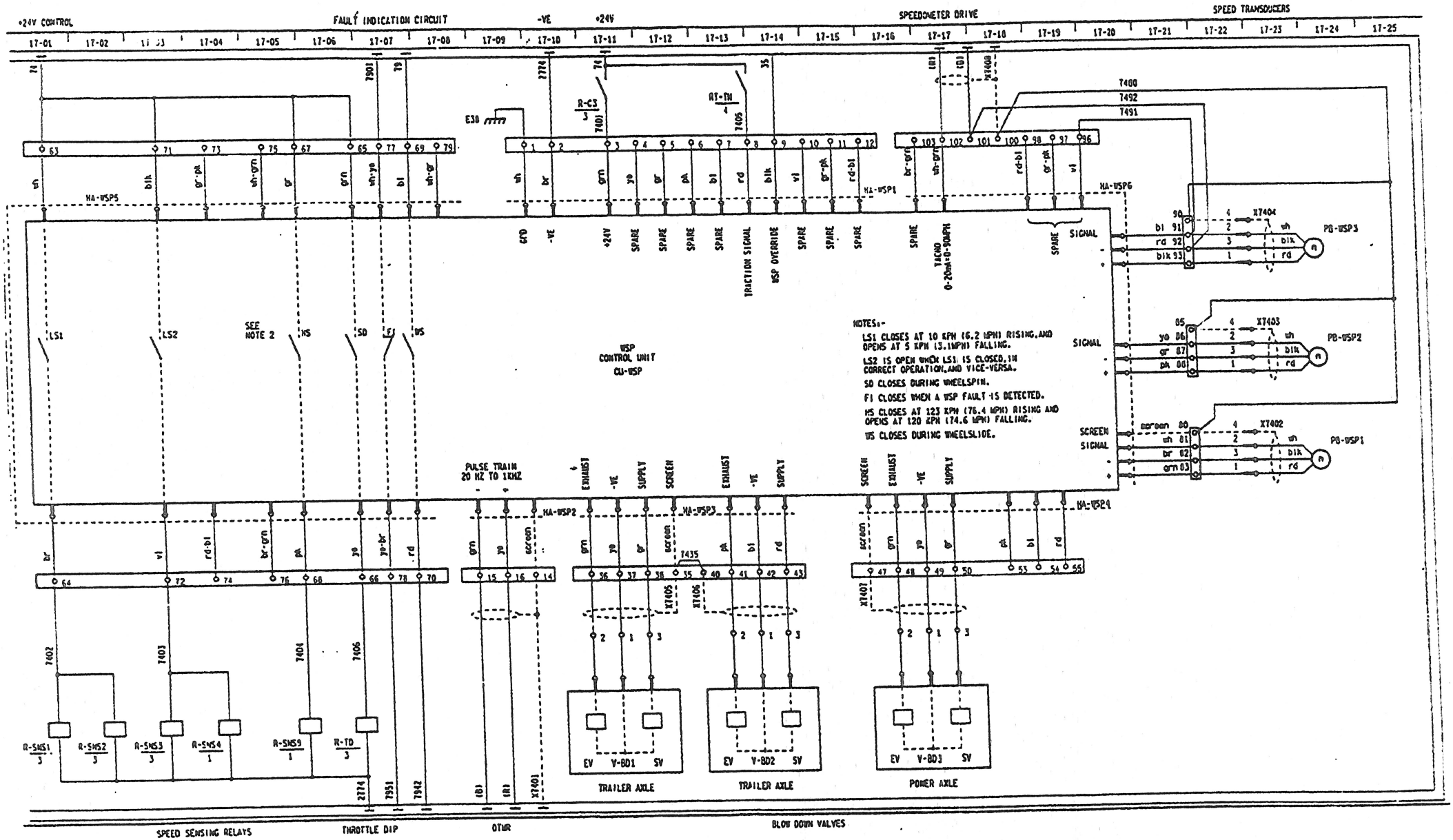
5. Replace cover on electronics case

4.3.3 Wheel Diameter Adjustment

Wheel diameter adjustment is in 16 steps between 780mm (minimum) to 840 mm (maximum) as in code chart.

The wheel diameter code is indicated by L.E.D. display. By pressing MEMORY button for at least 2 seconds '88' is displayed after which the code for the wheel diameter is shown. For example '12' at position 8 on switch for 812mm wheel diameter.

The wheel diameter switch should only have to be altered after tyre turning or when setting up a new control rack.



WSP electrical schematic

WSP. DIAGNOSTIC CHART

Digital Code	Fault description
05	Dump valve board MV1
06	Dump valve board MV2
08	Relay board Position of relay contacts is not the same as ordered
0b	Test/Diagnostic board There is no seriel communication between the testbord and the axlebords
OF	Filter board
P1	Microcomputer 1 is out of order (axle board A1)
P2	Microcomputer 2 is out of order (axle board A1)
P3	Microcomputer 3 is out of order (axle board A2)
P4	Microcomputer 4 is out of order (axle board A2)
10	Safety time dump valve 1
11	Sensor 1
13	Short circuit dump valve 1
14	Broken wire dump valve 1
20	Safety time dump valve 2
21	Sensor 2
23	Short circuit dump valve 2
24	Broken wire dmp valve 2
30	Safety time dump valve 3
31	Sensor 3
33	Short circuit dump valve 3
34	Broken wire dmp valve 3
72	Fault on one axle, only
73	Fault on more axles
77	Input signal 'Override' is active slide- and pin protection systems are blocked
88	Display test
89	The key 'Test' was pressed, the WSP-system is now on automatic diagnostic routine
95	Sporadic fault, during operation was a temporary fault
99	WSP System is all right.